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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/029,144	12/28/2001	Hye Young Kim	2658-0275P	5231
2292	7590	08/09/2004	EXAMINER	
BIRCH STEWART KOLASCH & BIRCH PO BOX 747 FALLS CHURCH, VA 22040-0747			QI, ZHI QIANG	
			ART UNIT	PAPER NUMBER
			2871	

DATE MAILED: 08/09/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/029,144

Applicant(s)

KIM ET AL.

Examiner

Mike Qi

Art Unit

2871

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 03 June 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-3 and 5-21 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-3 and 5-21 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

The Final Office Action mailed on Nov.3, 2003 is vacated and prosecution is reopened.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1, 4-13, 15-18, 20-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 6,001,539 (Lyu et al) in view of US 5,135,581 (Tran et al), US 5,628,933 (Carter et al) and US 6,466,293 (Suzuki et al).

Claims 1 and 13, Lyu discloses (col.1, lines 20-67; Fig. 2) that forming method of an LCD comprising:

- a substrate (11);
- a switching device (TFT) for driving the pixel electrode over the substrate (11);
- depositing a protective film (passivation layer 15 and 10) over the substrate (11) to cover the switching device;
- defining a contact hole in the protective film (15,10) to expose the drain electrode (34) of the switching device;

- forming pixel electrode (12) to connect the drain electrode (34) via the contact hole.

Lyn does not explicitly disclose that the pixel electrode is formed by placing the substrate in a vacuum chamber and injecting hydrogen-containing gas at a temperature of less than 400 °C, and the substrate has a temperature of less than about 200 °C when forming the pixel electrode.

However, Tran discloses (col.2, line 20 - col.4, line 58) forming an electrically conductive oxide composition used as a light transmissive electrode in a device, such as liquid crystal displays, by sputtering at temperature from 20 °C to 300 °C (less than Applicant's claimed range of 400 °C) with stabilizing gas such as H₂ or H₂O (hydrogen-containing gas), and preferably, the sputter depositing occurs at temperature of from 25 °C to 150 °C.

Tran also discloses (col.2, line 64 – col.3, line 6) that a room temperature process allows liquid crystal display to be prepared on a supports (substrate) which would otherwise be damaged by high temperature processes (preventing the damage by high temperature processes).

The depositing must include conductive electrodes depositing on a substrate, so that the substrate has a temperature less than 200 °C according to the room temperature process. The pixel electrode also is a conductive electrode. The forming process for a conductive electrode is also suitable for the pixel electrode in order to prevent the damage by high temperature processes.

As an evidence, Cater discloses (col. 1, lines 31-41; col.4, lines 16-38) that a transparent conductor forming method (deposition process) in which the substrate in a vacuum chamber was heated to 250 °C, and after growth of several thousand angstroms, the chamber was again evacuated and the substrate was permitted to cool to room temperature (i.e., less than 200 °C), and the film subsequently removed from the chamber has good electrical conductivity. According to the specification of the paragraph 0035 of this application, the depositing process allows the substrate temperature to be less than about 200 °C. Therefore, the substrate in the deposition process was also permitted to a cool temperature to be less than 200 °C, and the reference Cater reads this process in which the substrate was permitted to room temperature (less than 200 °C).

Concerning the limitation of placing the substrate in a vacuum chamber, Cater discloses (col.4, lines 16-38) that placing the substrate in a vacuum chamber, and the LCD forming process must use a vacuum chamber, and that is a conventional.

As an evidence, Suzuki discloses (col.19, line 43 – col.20, line 32) that a LCD forming process in which the substrates precisely superposed and adhered and then were placed in a vacuum chamber.

Therefore, it would have been obvious to those skilled in the art at the time the invention was made to use a forming process such as injecting hydrogen-containing gas at a temperature less than 400 °C and the substrate has a temperature of less than 200 °C as claimed in claims 1 and 13 for preventing the damage by high temperature processes and obtaining good electrical conductivity.

Claims 6 and 15, Lyn discloses (col.1, lines 20-67; Fig. 2) that forming a gate electrode (23) over the substrate (11); entirely depositing a gate insulating film (21) over the substrate (11) to cover the gate electrode (23); and continuously depositing a semiconductor layer (22) as active layer and an ohmic contact layer (33) to overlap the gate electrode (23).

Claims 7-9 and 16, Lyn discloses (col.1, lines 20-67; Fig. 2) that the passivation layer (15,10) is made from an inorganic insulating material such as silicon nitride, silicon oxide, etc., or an organic insulating material.

Claims 10-11 and 17, Lyn discloses (col.1, lines 20-67; Fig. 2) that the pixel electrode (12) is formed from the transparent conductive material such as indium tin oxide (ITO).

Claims 12 and 18, Lyn discloses (col.1, lines 20-67; Fig. 2) that the source and drain electrodes (24,34) of the switching device is made of Mo.

Claims 20 and 21 are redundant. Because the claims 1 and 13 already have such limitations such as the substrate has a temperature of less than about 200°C, and the 200°C temperature is a half of the 400°C temperature (also see the explanation of Tran, Cater and Kaijou above).

3. Claims 2-3, 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lyn, Tran, Cater and Suzuki as applied to claims 1, 4-13, 15-18, 20-21 above, and further in view of US 6,433,842 (Kaneko et al).

Claims 2-3 and 14, lacking limitation is such that the pixel electrode has an amorphous structure, and is etched with a weak acid etchant.

However, Kaneko discloses (col.5, lines 47 – 51) that the amorphous indium tin oxide (ITO) or indium zinc oxide (IZO) is preferably used as the material of the pixel electrodes, because the amorphous structure allows for use of a weak acid etchant, so that the aluminum alloy is prevented from being damaged during etching of the pixel electrodes. Kaneko also discloses (col.9, lines 7 – 43) that by using the weak acid, the layered structure (such as gate electrode) underlying the ITO film is secured from being damaged during the etching of the ITO film.

Therefore, it would have been obvious to those skilled in the art at the time the invention was made to use amorphous structure as the pixel electrode and use weak acid etchant as claimed in claims 2-3 and 14 for securing the electrodes underlying the pixel electrodes from being damaged during the etching of the ITO film.

4. Claims 5 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lyn, Tran, Cater and Suzuki as applied to claims 1, 4-13, 15-18, 20-21 above, and further in view of US 5,972,527 (Kaijou et al).

Claims 5 and 19, lacking limitation is such that the substrate has a temperature between about 50 °C and about 150 °C when forming the pixel electrode.

However, Kaijou discloses (col.1, line 66- col.2, line 45; col.6, line 48 – col.11, line 57) that a sputtering method for producing a conductive layer in which the substrate temperature is preferably between room temperature and 200°C (col.11, lines 47-56) (the ranges of 50 °C to 150 °C overlap the ranges of 25 °C to 200°C), and the conductive layer having excellent electrical conductivity by such sputtering method

(col.2, lines 40-45); and in the case where the claimed ranges "overlap ranges disclosed by the prior art" a prima facie case of obviousness exists (see MPEP 2144.05. I.).

Therefore, it would have been obvious to those skilled in the art at the time the invention was made to use a temperature between about 50 °C and about 150 °C when forming the pixel electrode as claimed in claims 5 and 19 for achieving the excellent electrical conductivity.

Response to Arguments

5. Applicant's arguments filed on June.3, 2004 have been fully considered but they are not persuasive.

Applicant's arguments are as follows:

1) The description of the conventional process in the specification cannot be a prior art.

2) The stabilizing gas (H_2 or H_2O) in the reference Tran is different from the hydrogen-containing gas.

3) The references do not teach the pixel electrode is formed by placing the substrate in a vacuum chamber and injecting hydrogen-containing gas at a temperature of less than about 400°C, and the substrate has a temperature of less than about 200°C when forming the pixel electrode, and the references do not report the substrate temperature.

Examiner's responses to Applicant's arguments are as follows:

1) The conventional process such as the conventional Figs. 1A-1D must be a prior art, because the conventional process means of traditional design (see Merriam-webster's Collegiate Dictionary).

2) The stabilizing gas (H_2 or H_2O) in the reference Tran having hydrogen (H_2) that must be hydrogen-containing gas.

3) Tran discloses (col.2, line 20 - col.4, line 58) forming an electrically conductive oxide composition used as a light transmissive electrode in a device, such as liquid crystal displays, by sputtering at temperature from about 20 °C to about 300 °C (less than Applicant's claimed range of 400 °C) with stabilizing gas such as H_2 or H_2O (hydrogen-containing gas), and preferably, the sputter depositing occurs at temperature of from 25 °C to 150 °C. Tran also discloses (col.2, line 64 – col.3, line 6) that a room temperature process allows liquid crystal display to be prepared on a supports (substrate) which would otherwise be damaged by high temperature processes (preventing the damage by high temperature processes). The depositing must include conductive electrodes deposited on a substrate, so that the substrate has a temperature less than 200 °C. The pixel electrode also is a conductive electrode. The forming process for a conductive electrode is also suitable for the pixel electrode in order to prevent the damage by high temperature processes.

As an evidence, Cater discloses (col. 1, lines 31-41; col.4, lines 16-38) that a transparent conductor forming method (deposition process) in which the substrate in a vacuum chamber was heated to 250 °C, and after growth of several thousand angstroms, the chamber was again evacuated and the substrate was permitted to cool

to room temperature (i.e., less than 200 °C), and the film subsequently removed from the chamber has good electrical conductivity. According to the specification of the paragraph 0035 of this application, the depositing process allows the substrate temperature to be less than about 200 °C. Therefore, the substrate in the deposition process was also permitted to a cool temperature to be less than 200 °C, and the reference Cater reads this process in which the substrate was permitted to room temperature (less than 200 °C).

As another evidence, Kaijou discloses (col.1, line 66- col.2, line 45; col.6, line 48 – col.11, line 57) that a sputtering method for producing a conductive layer in which the substrate temperature is preferably between room temperature and 200°C, and the conductive layer having excellent electrical conductivity by such sputtering method.

Conclusion

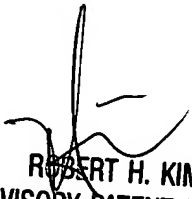
6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mike Qi whose telephone number is (571) 272-2299. The examiner can normally be reached on M-T 8:00 am-5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Robert Kim can be reached on (571) 272-2293. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Mike Qi
July 15, 2004



ROBERT H. KIM
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800